**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:

Jeff EDER

Serial No: 09/761,670

Filed: October 17, 2000

For: A METHOD OF AND SYSTEM FOR EVALUATING CASH FLOW AND ELEMENTS OF A BUSINESS ENTERPRISE

Group Art Unit: 3692

Examiner: Sigfried Chencinski

## Reply Brief

Commissioner of Patents
Washington, D.C. 20321

Sir or Madam:

This Reply Brief is being submitted in response to the Examiner's Answer for the above referenced application mailed on January 9, 2008.

A Reply Brief is required to highlight the fact that the actions and documents produced by the U.S.P.T.O. in association with the above referenced application are non-statutory. The Appellant is entitled to an unbiased review of its patent applications by Examiners with substantial knowledge of the relevant arts who conduct an examination in accordance with the relevant statutes and court precedents. As discussed below, the review of this application bears little resemblance to the examination envisioned by those who enacted the relevant statutes. This Reply Brief sets forth the apparent violation of the APA, 35 USC 3, 35 USC 101, 35 USC 102, 35 USC 103, 35 USC 112, 35 USC 131, 37 CFR 1.97, 37 CFR 1.98 and 37 CFR 1.104. The Reply Brief summarizes the arguments made to traverse the claim rejections and the evidence of the apparent bias, statute violation(s) and skill deficit associated with each ground of rejection presented by the Examiners.

**1. Status of Claims**

Claims 43 - 46, 48 – 52, and claims 54 - 86 are pending and are the subject of this appeal. No other claims are pending. Claims 1 – 42, 47, 53 and 87 – 88 have previously been cancelled without prejudice.

**2. Grouping of Claims**

For each ground of rejection which the Appellant contested in the Appeal Brief and in this Reply Brief that applies to more than one claim, such additional claims, to the extent separately identified and argued in the Appeal Brief and/or the Reply Brief, do not stand and fall together.

**3. Grounds of rejection to be reviewed on appeal**

Pending claims have been rejected under 35 USC 101, 35 USC 103 and 35 USC 112 first and second paragraphs as detailed in the Appeal Brief and as discussed briefly below.

**4. Related appeals**

An appeal for U.S. Patent Application 08/999,245 filed December 10, 1997 may be affected or have a bearing on this appeal. An appeal for U.S. Patent Application 09/688,983 filed on October 17, 2000 may be affected by or have a bearing on this appeal. An appeal for U.S. Patent Application 10/282,113 filed October 29, 2002 may be affected or have a bearing on this appeal.

The related appeals provide substantial evidence that the U.S.P.T.O. appears to lack the required level of skill in the art to author written description rejections and that the apparent violation of a number of statutes associated with this application is part of a larger pattern of discrimination and bias. In particular, the rejection of applications 08/999,245 and 10/282,113 are based on an unworkable combination of Lyons (U.S. Patent 4,989,141) and the conventional database management systems taught in Database Management by Gordon C. Everest. The Lyons invention was specifically developed to overcome the limitations of conventional database management systems. In spite of this, the U.S.P.T.O. has proposed replacing this unique capability with a conventional database management system that would destroy the ability of the Lyons invention to complete its primary function. The cited combination also fails to teach at least one limitation for every claim and teaches away from the claimed methods and combination.

The rejection of application 09/688,983 is very similar to the rejection of the claims for the instant application as claims in both applications have been rejected:

1) without evidence for an alleged, demonstrably false, lack of concreteness;

2) for obviousness based on an unworkable combination of documents that fails to teach at least one limitation for every claim and teaches away from the claimed methods; and

3) for written description by Examiners with a well documented lack of skill in the relevant arts.

The rejections in both cases also appear to be motivated by a desire to "protect" patents issued to large companies in apparent violation of 35 USC 102, 35 USC 103 and/or 35 USC 112. An overview of the BPAI decision on the related 09/761,671 appeal provides evidence that the same issues (1 – 3 above) may adversely impact decisions made by the BPAI (see page 9, Reply Brief Appendix).

**5. Summary of Legal Arguments (new arguments underlined)**

**The rejection of claim 43, claim 44, claim 45, claim 46, claim 48, claim 49, claim 50, claim 52, claim 54, claim 55, claim 56, claim 57, claim 58, claim 59, claim 60, claim 61, claim 62, claim 64, claim 65, claim 66, claim 67, claim 68, claim 69, claim 70, claim 71, claim 72, claim 73, claim 74, claim 75, claim 77, claim 78, claim 79, claim 80, claim 81, claim 82, claim 83, claim 84, claim 85 and/or claim 86 under:**

**A) 35 USC 101 can be traversed by noting:**

1) the Examiner has failed to establish a prima facie case of non-statutory subject matter for the rejected claims by failing to provide any evidence and by apparently failing to note the cross referenced patent 5,615,109 that discusses purchasing optimization (see Appeal Brief for details);

2) the claimed inventions produce results that are tangible, concrete and useful (see Appeal Brief for details);

3) the claimed inventions transform transaction data into a different state or thing, either:

a) network models that have utility in optimizing corporate purchasing activity, forecasting financial performance for a corporation and managing operations;

b) a model of enterprise current operation financial performance that has utility in optimizing corporate purchasing activity, forecasting financial performance for a corporation and managing operations, and/or

c) an integrated database that has utility in enabling the development of models, the creation of forecasts and the completion of optimization analyses; and

4) the arguments regarding the alleged non-statutory subject matter fail to comply with the requirements of the Administrative Procedures Act (see Appeal Brief for details).

**B) 35 USC 103 can be traversed by noting that the arguments in support of the obviousness rejections fail to establish prima facie case of obviousness because:**

1) The cited documents fail to make the invention as a whole obvious by teaching away from the claimed methods (see Appeal Brief for more details).

a) Sandretto teaches: back-fitting data to a risk return model in place of regression model development (Sandretto, C17, L43 – 49), the analysis of separate assets on an individual basis in place of analyzing interacting elements of value as a group and data entry from a keyboard in place of integrating data from a plurality of transaction systems,

b) Jost teaches: classification and pattern matching in place of the regression analysis taught and practiced by the claimed invention (Jost, C1, L35), and

c) Barr teaches the development of a neural network model for each stock in place of a single variable for each element of value and an optimization model in place of a regression model.

2) The cited documents fail to teach anything remotely close to a model of elements of value connected to aspects of financial performance with the support of an integrated database. Sandretto teaches back-fitting risk return models, Barr teaches equity portfolio selection and Jost teaches real estate valuation. They also fail to teach one or more limitation for every claim (see Appeal Brief for details);

3) Modifying the cited documents to replicate the functionality of the claimed inventions would

require changes in the principles of operation for the cited inventions:

a) Sandretto would have to change from back-fitting a risk return model to regression model development, from separate, individual assets to inter-dependent assets that interact with one another and from a reliance on keyboard input to the use of a data acquisition system;

b) Jost would have to change from classification and pattern matching to regression and from using physical characteristics to determine value to using weights for determining impact; and

c) Barr would have to rely on a single variable in place of a neural network model for each stock and would have to replace an optimization model with an optimized regression model.

4) The changes required to make the cited document (Sandretto) and/or the cited combinations replicate the claimed inventions would destroy the ability of each of the inventions described in the cited documents to function (see item B 3 for some of the many obvious reasons why).

5) The Examiner(s) have been unable to identify the specific manner in which the Sandretto invention is to be modified or the proposed combinations made (see Appeal Brief).

6) Sandretto's use of a back-fit risk return model teaches away from a combination with the neural network model development methods of Jost and Barr.

**C) 35 USC 112 first paragraph can be traversed by noting that the arguments in support of the written description rejections fail to establish prima facie case of a lack of written description because:**

1) the Examiner has failed to establish a prima facie case that would support a written description rejection under 35 USC 112 first paragraph for a single claim because:

a) No claim limitation(s) at issue have been identified. Vague concerns regarding the specification have been articulated but no specific claim limitations or missing steps have been identified;

b) No evidence has been presented. As rejection under §112 first paragraph requires a preponderance of evidence and express findings of fact. In spite of this, no facts have been identified and no evidence has been presented; and

c) Relevant evidence has not been considered. Although the expert providing a declaration stating that the written description was complete has considerable expertise in the development of network models, this Examiner refused to consider this evidence (see page 62, Appeal Brief appendix). The summary of claimed subject matter also appears to have been ignored;

2) the specification and drawings clearly explain how to make and use the invention described by each of the cited claims (see Appeal Brief for details); and

3) the arguments that were used to support a written description rejection under 35 USC 112 first paragraph fail to comply with the requirements of the APA in part because the Examiners and the U.S.P.T.O. have a well documented lack of skill in the relevant arts (see B1 – B6 for evidence) required to author such claim rejections (see Appeal Brief for more details).

**D) 35 USC 112 second paragraph can be traversed by noting that the arguments in support of the written description rejections fail to establish a prima facie case of claim indefiniteness because:**

1) the arguments presented fail to establish a prima facie case that would support a written description rejection under 35 USC 112 second paragraph for a single claim (see Appeal Brief),

2) the arguments used to support a written description rejection under 35 USC 112 second paragraph fail to comply with the requirements of the APA (see Appeal Brief),

3) the specification and drawings clearly define the metes and bounds of each claim. For example the portion of data used is clearly spelled out in the specification. It is the revenue, expense and capital change data and the data required to complete the calculations identified in Table 17. In a similar manner, the aspects of financial of financial performance being modeled, revenue, expense, capital change, cash flow and value are clearly identified in the specification. (see Appeal Brief for details).

**6. Evidence of inequitable application of the law**

The General Counsel for the U.S.P.T.O. summarized the results of several Supreme Court cases in presenting a "data transformation test" for evaluating the subject matter eligibility of a claimed invention in a brief filed in association with In Re Comiskey. The claimed inventions all pass this "test" by physically transforming transaction data into a different thing. In spite of this, the claims were rejected under 35 USC 101 as being non-statutory.

The Examiner has refused to consider evidence relating to the concreteness of the claimed invention that was submitted in accordance with 37 CFR 1.97 and 1.98.

The Examiner refused to respond to requests submitted under 37 CFR 1.104 for specifics regarding: alleged inadequacies in the written description, the alleged need for subjective judgment the allegedly indefinite claims and the skill level of someone of average skill in the art (see page 10, Reply Brief Appendix).

U.S. Patent 6,393,406, which matured from the parent of this application, discloses a method for developing a network model that performs regression analyses for use in business planning and value analysis (the function of the Tulskie invention). In an apparent violation of 35 USC 102 and/or 35 USC 103 it was not a bar to either Tulskie or Chappel.

Developing and using models for planning (Chappel) and value analysis (Tulskie) is considered statutory when "invented" by large companies and non-statutory when claimed by the Appellant.

Tulskie relies on subjective beliefs and impressions for input data, network structure, model development and results. Harhen (U.S. Patent 5,406,477) teaches that models developed from subjective data provided by individuals (such as Tulskie) require an elaborate reconciliation system in order to produce useful results. The Tulskie invention does not describe the development or use of such a system and yet it was deemed to have an adequate written description.

Rolls Royce recently received a patent for using the method for network model development disclosed in the instant application (see page 11, Reply Brief Appendix).

KSR v Teleflex has raised the level of skill in the art that can be expected from those reading and practicing an invention but the tenets of this decision do not appear to be reflected in the findings.

The Examiner refused to consider a Rule 132 affidavit relating to the adequacy of the written description that was submitted by an expert in mathematical modeling.

**7. Evidence of bias in the review of this application**

The method for model development disclosed in the instant application has been recognized by academic researchers as being the best method for automatically developing a neural network model in an automated fashion (see page 12, Reply Brief Appendix). Over 3,300 patents with claims for neural networks have been issued to other firms – only one of them (a patent recently issued to Rolls Royce) cites the concrete method disclosed in the instant application for neural network model development. If the claimed inventions are not concrete, then the U.S.P.T.O. has evidently issued over 3,300 invalid patents because each of them uses a method for developing neural network models that is less concrete than the one "best" method disclosed by the instant application.

The cited reference Barr teaches a method that requires hundreds of neural networks to input data to a neural network and it is considered to be concrete.

Chappel received a patent (7,236,940) for developing a time series, regression model for use in planning business operations in June of 2007 from a 2001 filing. By way of contrast, the claims in the instant application for developing a plurality of network models that complete time series regression analyses for use in planning and optimizing business operations were rejected as non-statutory in January of 2007. A Reply Brief confirming this rejection was mailed in January of 2008.

The term "at least a portion of the data" has been used in several hundred patents without apparent problems (see page 13, Reply Brief Appendix).

A simple comparison of rejected claim 54 and claim 1 in Tulskie shows that they are similar.

| Instant application (allegedly indefinite) | Tulskie (U.S. Patent 6,249,768) |
|---|---|
| 54. A firm analysis method, comprising: aggregating firm related data from a plurality of systems in accordance with a common data dictionary, using at least a portion of the data to generate a plurality of network models which connect one or more current elements of value of said firm to one or more aspects of financial performance of said firm, said network models being further comprised of:<br>one or more input nodes, hidden nodes and output nodes where each input node represents an element of value and each output node represents an aspect of financial performance, and<br>a plurality of relationships where each relationship is a function of an impact of each element on other elements of value or an aspect of financial performance;<br>where each network model from a plurality of network models supports the development of a controlling forecast for use in optimizing purchasing. | 1. An integrated framework for analyzing a firm, comprising: a strategic capability network for connecting present resources of said firm through present capabilities of said firm to present value propositions of said firm, said strategic capability network being further comprised of:<br>nodes, each said node being a capability, a resource or a strategic position, each said resource having a cost and each said strategic position having a value; and<br>relationships between said nodes, each said relationship being directional and being characterized by a degree of support from a supporting one of said nodes to a supported one of said nodes, said degree of support being dependent upon said present resources, said present capabilities and said present value propositions;<br>one or more future scenarios used for modifying said strategic capability network, each said future scenario serving to modify said present resources, said present capabilities and said present value propositions. |

**8. Further evidence that the U.S.P.T.O. lacks the required skill in the relevant arts**

The Examiners reviewing this application do not appear to understand any aspect of the claimed invention as they apparently do not know the difference between back-fitting a risk return model (as taught by Sandretto), pattern matching and classification model development (as taught by Jost), optimization model development (as taught by Barr) and the regression model evolution taught by the claimed invention. It would be hard to find a less relevant set of prior art documents.

The Examiners for this application apparently do not see the inherent contradiction of citing a reference (Barr) which discloses an invention that relies on creating and using hundreds of neural networks for hundreds of companies in developing an optimization model while stating that the development and use of a handful of neural network models for a single company is not concrete.

Examiners for application 09/761,671, 10/329,172 and 10/746,673 have cited scoring references to support obviousness rejections of claims that rely on regression analysis.

The Examiners for this application have not been able to explain how Sandretto would be modified and/or how the cited combinations would be made.

Claim 43, claim 54, claim 67 and associated dependent claims 44 through 52, 55 through 66 and 68 through 79 rely on language that mirrors the formal definition of a network. The claims using this language are rejected as indefinite because the Examiners apparently do not understand this definition.

**9. Conclusion**

As noted on the first page of this Reply Brief, it appears that the U.S.P.T.O. has not fully complied with the requirements set forth in the APA, 35 USC 3, 35 USC 101, 35 USC 102, 35 USC 103, 35 USC 112, 35 USC 131, 37 CFR 1.97, 37 CFR 1.98 and 37 CFR 1.104. The Appellant also notes that at least some of the claims in the instant application appear to be misclassified under class 705 and that there appears to have been repeated violations of MPEP 904.03.

For these reasons and the extensive reasons detailed above, in the Appendix and in the previously filed Appeal Brief, the Appellant respectfully but forcefully contends that each claim is patentable. Therefore, reversal of all rejections is courteously solicited.

Respectfully submitted,

Asset Trust, Inc.

/B.J. Bennett/

B.J. Bennett, President
March 10, 2008

## APPENDIX

**35 USC 103 rejection of claim 69 on the basis of Bielinski, Daniel W.; "How to sort out the premium drivers of post-deal value" (hereinafter Bielinski), further in view of Brown, Carol E, Coakley, James, Phillips, Mary Ellen; "Neural Networks Enter the World of Management Accounting"; Management Accounting; (hereinafter Brown)**

**Summary of Arguments Traversing Claim Rejection**

The arguments in support of the obviousness rejections fail to establish prima facie case of obviousness because:

1) The cited documents teach away from their own combination. Bielinski specifically prohibits the use of forecasts while the cited portion of Brown teaches a method with only one function: forecasting changes in stock prices.

2) The cited documents fail to make the invention as a whole obvious by teaching away from the claimed methods. Bielinski teaches: efficient market in place of an inefficient market, a tree based analysis in place of a network analysis and three determinants of market value (cash flow, cash flow risk and growth) in place of the elements of value as determinants of value. Brown teaches: scoring in place of regression and 40 external factors determine market value in place of elements of value as determinants of value.

3) Modifying the cited documents to replicate the claimed functionality would require changes in the principles of operation for the cited inventions and destroy their ability to function. Bielinski would have to change from a tree to a network and it is well known that substituting a neural network sigmoid in place of the tree node would destroy its ability to function. Brown would have to change to using elements of value as determinants of value and use regression in place of scoring.

4) The cited combination fails to teach one or more limitation for every claim.

**Evidence of bias in the BPAI review of this application**

Bielinski specifically states that the disclosed VBM method follows the principles of Shareholder Value Analysis (SVA). One of the principles of SVA is the efficient market theory. In spite of these facts, the BPAI said there was no evidence that Bielinski taught the efficient market theory.

Bielinski specifically states that the disclosed VBM method follows the principles of SVA. One of the principles of SVA is the tree based analysis of cash flow. In spite of these facts, the BPAI said there was no evidence that Bielinski taught the tree based analysis of cash flow.

Bielinski specifically states that the disclosed VBM method follows the principles of SVA. One of the principles of SVA is that there are 3 determinants of market value. In spite of these facts, the BPAI said there was no evidence that Bielinski taught there were 3 determinants of market value.

**Evidence of inequitable application of the law**

Bielinski's prohibition on forecasts is a clear discouragement of a combination with an invention for producing forecasts such as Brown. In spite of this the rejection was upheld – a decision that clearly goes against precedent established by In re Fulton, 391 F.3d at 1199-1200.

The fact that the cited combination failed to teach one or more limitations for every claim was completely disregarded when the rejection was upheld – a decision that clearly goes against precedent established by In re Royka, 490 F.2d 981, 180 USPQ 580.

The question as to whether a combination of documents is obvious revolves around obviousness to someone of average skill in the art, not to a U.S.P.T.O. employee who lacks an average level of skill in the art. It would be (and is) obvious to someone of average skill that the cited combination was and is unworkable (since a teaching is no longer required, an explicit warning is not required either).

**Further evidence that the U.S.P.T.O. lacks the required skill in the relevant arts**

It is well known to those of average skill in the art that VBM teaches: the tree based analysis of cash flow, the efficient market theory and that market value is determined by 3 factors. The BPAI (and the Examiners for this application) apparently were not aware of these facts.

The Assignee also requests that, in accordance with the provisions of 37 CFR 1.104, the Examiner provide an affidavit detailing all evidence in possession of anyone in the Office that supports the opinion that the claimed invention (claims 43 – 88) is not tangible, concrete and/or useful. This affidavit should include all evidence that the specification for the above referenced application: "fails to present a method and system where the results can be replicated by others because qualitative judgments are involved in the method such that even the same practitioner seems unlikely to be able to replicate the same result for the same case in multiple iterations of operating the model." The Assignee also requests that, in accordance with the provisions of 37 CFR 1.104, the Examiner provide an affidavit detailing all evidence in possession of anyone in the Office that supports an assertion that the above referenced application: lacks an adequate written description, fails to enable those of average skill in the relevant arts to make or use the claimed invention and/or has one or more claims that are indefinite. In the paragraph that follows these three alleged shortcomings will be referred to as the "alleged written description deficiencies." As part of the one or more alleged written description deficiency affidavits, the Examiner is requested to identify the missing steps that allegedly prevent an ordinary practitioner of the art from successfully apply the invention to produce a concrete, reproducible quantitative valuation result of a firm.

It is well established that when an invention, in its different aspects, involves distinct arts, the specification is enabling if it enables those skilled in each art, to carry out the aspect proper to their specialty (see MPEP 2164.05). Accordingly, the Assignee further requests that as part of the affidavit or affidavits related to alleged written description deficiencies that the Examiner identify the arts judged to be contained in each claim. The Assignee also requests that the Examiner provide the name, address, phone number, email address and professional background of each individual providing input to the opinion regarding the alleged written description deficiencies contained in the 9 May 2006 Office Action. It would be a clear abuse of discretion to allow those without the requisite skill level to provide input to such an opinion.

These affidavits are required for inclusion in the appeal that will be filed if the claims are not granted. A failure to provide all the requested affidavits containing all the requested information will be taken as further evidence that the findings in the 9 May 2006 Office Action are arbitrary and capricious.

US007251582B2

(12) **United States Patent**
**Singh et al.**

(10) **Patent No.: US 7,251,582 B2**
(45) **Date of Patent: Jul. 31, 2007**

(54) **FAULT DIAGNOSIS**

(75) Inventors: **Ritindar Singh**, Cranfield (GB); **Suresh Sampath**, Cranfield (GB)

(73) Assignee: **Rolls-Royce, PLC**, London (GB)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 518 days.

(21) Appl. No.: **10/752,537**

(22) Filed: **Jan. 8, 2004**

(65) **Prior Publication Data**

US 2004/0216004 A1 Oct. 28, 2004

(30) **Foreign Application Priority Data**

Jan. 24, 2003 (GB) ..... 0301707.6

(51) **Int. Cl.**
***G06F 9/00*** (2006.01)

(52) **U.S. Cl.** ..... **702/183**; 702/185; 714/25

(58) **Field of Classification Search** ..... 702/123, 702/179, 182, 183, 185, 186, 188; 705/7, 705/8; 706/13, 45; 714/48, 10, 25; 703/14
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | | |
|---|---|---|---|---|
| 5,105,372 | A | 4/1992 | Provost et al. | 702/185 |
| 5,539,652 | A | 7/1996 | Tegethoff | 703/14 |
| 5,897,629 | A | 4/1999 | Shinagawa et al. | 706/13 |
| 6,052,678 | A | 4/2000 | Itoh et al. | 706/13 |
| 6,282,527 | B1 | 8/2001 | Gounares et al. | 706/13 |
| 6,324,659 | B1 | 11/2001 | Pierro | 714/48 |
| 6,606,580 | B1 | 8/2003 | Zedda et al. | 702/185 |
| 7,017,079 | B2 * | 3/2006 | Gulati et al. | 714/25 |
| 2001/0034628 | A1 | 10/2001 | Eder | 705/7 |

FOREIGN PATENT DOCUMENTS

| | | |
|---|---|---|
| EP | 1 103 926 A2 | 5/2001 |
| GB | 2 362 481 A | 11/2001 |
| WO | WO 00/38079 | 6/2000 |

OTHER PUBLICATIONS

Potter et al. "Improving the Reliability of Heuristic Multiple Fault Diagnosis Via the EC-Based Genetic Algorithm," Journal of Applied Intelligence Jul. 2, 1992, pp. 5-23.

(Continued)

*Primary Examiner*—John Barlow
*Assistant Examiner*—John Le
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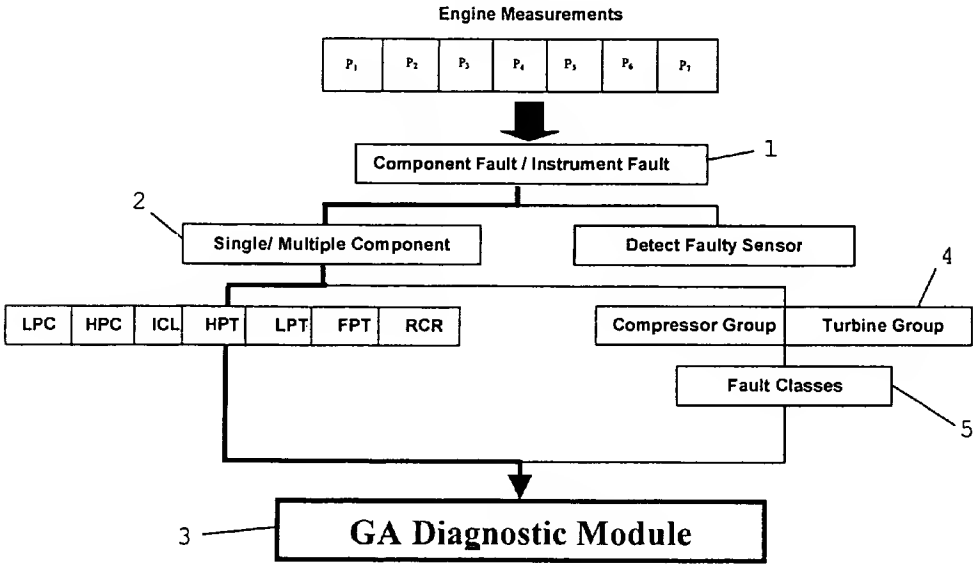
(57) **ABSTRACT**

Methods for estimating performance of and/or detecting faults in components of a multi-component system, where the performance of each component is defined by one or more performance parameters x related to measurement parameters z that can be expressed as a function of the performance and operating parameters defining an operating condition of the system. The methods include: defining a series of fault classes corresponding to possible outcomes of faulty components; creating an initial population of strings for each fault class, each including a plurality of elements corresponding to the performance and operating parameters, values being assigned to the string elements which represent estimated values of said parameters and are constrained only to indicate fault affected values for performance parameters of the fault affected component of the respective class; and optimising an objective function which gives a measure of the consistency between measured and calculated values of the measurement parameters.

**14 Claims, 8 Drawing Sheets**



Proceedings of the First International Conference on Machine Learning and Cybernetics, Beijing, 4-5 November 2002

# BP NEURAL NETWORK OPTIMIZATION BASED ON AN IMPROVED GENETIC ALGORITHM

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**Abstract:**

**An improved Genetic Algorithm based on Evolutionarily Stable Strategy is proposed to optimize the initial weights of BP network in this paper. The improvement of GA lies in the introducing of a new mutation operator under control of a stable factor, which is found to be a very simple and effective searching operator. The experimental results in BP neural network optimization show that this algorithm can effectively avoid BP network converging to local optimum. It is found by comparison that the improved genetic algorithm can almost avoid the trap of local optimum and effectively improve the convergent speed.**

**Keywords:**

**Evolutionarily stable strategy; Genetic algorithm; Neural network; Back propagation (BP) algorithm; Premature convergence**

## 1 Introduction

In recent years, there have been many attempts in designing artificial neural networks automatically, in which the combination of evolutionary algorithms and neural networks has attracted a great deal of attention and one kind of evolutionary artificial neural network has been formed. Evolving neural networks by genetic algorithm were researched earliest of all.

The efficiency of GA has great influences on BP neural network (BPNN) optimization. During application of GA, however, there often exists a problem of premature convergence and stagnation [1]. Whitley think that selective pressure and selection noise are the main factors of affecting population diversity [2]. Higher selective pressure often leads to the loss of diversity in the population, which causes premature convergence at the same time of improving convergent speed. Therefore, keeping the balance between population diversity and convergent speed is very important to the performance of GA.

In recent years, many diversity preservation methods have been developed to avoid premature convergence to a local optimum. These can be divided into the following three subclasses:

1)Schemes of alleviating selective pressure to keep the biologic diversity, such as the modification of selection operator [3-5] and scale-transformation of fit function [6]. Unfortunately, these methods often cause another problem of slow rate of convergence or stagnation in searching global optimum at the same time of improving population diversity.

2)Non-static mutation rate control schemes including dynamic [7-10], adaptive or self-adaptive [10-12] mechanism to control the rate of mutation. The mutation operator is a main operator to keep the biologic diversity, especially in real-coded GA, because it introduces new search space and maintain the genetic diversity of a population, whereas the crossover operator only operates in the known search space. From this point of view, high mutation rate is good for searching the global solution. But too high mutation rate will result in blind stochastic search. It has been proved that deterministically varying mutation rates during the search have a better performance compared to the fixed mutation rate schemes. Unfortunately, there are some drawbacks in non-static mutation rate control schemes. The dynamic parameter control scheme requires for the user to devise a schedule specifying the rate at which the parameter is typically decreased. The self-adaptive scheme does not need such a specific schedule. Unfortunately it is rather complicated to explain to novice users, and as a result they usually prefer the simple fixed mutation rate scheme.

3)Spatial separation schemes [13-14]. One of the most important representatives is the distributed GA's (DGA's). Their premise lies in partitioning the population into several subpopulations, each one of them being processed by a GA independently of the others. Furthermore, a migration mechanism produces a chromosome exchange between the subpopulations. In this way, a distributed search and an effective local tuning may be obtained simultaneously. They are suitable for producing multi-resolution in search space but run risk of running too much CPU time.

A genetic algorithm based on evolutionarily stable strategy (ESSGA) is proposed in this paper to try to pursue better balance between population diversity and convergent speed by means of introducing a new kind of mutation operator under the control of a stable factor. Different from other mutation rate control schemes, this mutation operator only acts on some of the preponderant individuals under the control of a stable factor, which keeps the ratio of quantity

0-7803-7508-4/02/$17.00 ©2002 IEEE

The method of claim 1, wherein said processing includes transforming **at least a portion of said data** into a frequency domain. 3. The method of claim 1. ...

Refrigeration control system
US Pat. 7290398 - Filed Aug 25, 2004 - Computer Process Controls, Inc.
The method of claim 1 further comprising copying **at least a portion of said data** set to an asset management database from said refrigeration system ...

Method for automated print ordering utilizing the internet
US Pat. 7143056 - Filed Jan 18, 2000
... comprises the step of merging **at least a portion of said data** collected according to said field list with said template of said prototypical product ...

Power supply protection apparatus for computer system
US Pat. 6901520 - Filed Feb 16, 2001 - International Business Machines Corporation
... said data processing circuitry having associated therewith a withstand voltage value above which **at least a portion of said data** processing circuitry is ...

Method of selecting and storing airline ticket data
US Pat. 7017806 - Filed Oct 22, 2004
... selecting from said data stream **at least a portion of said data** for recording onto said magnetic media to provide a selected data stream, ...

Data processing system providing secure communication between software ...
US Pat. 7171684 - Filed May 4, 2000 - Alcatel
... to said first request to said software application, **at least a portion of said data** being contained in said first 20 request for said security service. ...

System and method for transformation and analysis of messaging data
US Pat. 7231403 - Filed Nov 15, 2002 - MessageOne, Inc.
The method of claim 1, further comprising: storing, by said data collector system, **at least a portion of said data** useful in deriving desired messaging ...

System and method for providing customized secure access to shared documents
US Pat. 7299502 - Filed Feb 14, 2001 - Hewlett-Packard Development Company, L.P.
... encrypting **at least a portion of said data** on said server; communicating said encrypted data from said server to said client; and decrypting said data ...

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